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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/075,330	02/14/2002	Jyhchau Horng	MH-5092	8692

7590 10/18/2005  
Patent Department  
Mitsubishi Electric Research Laboratories, Inc.  
201 Broadway  
Cambridge, MA 02139

EXAMINER
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FILE, ERIN M

ART UNIT	PAPER NUMBER
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2634

DATE MAILED: 10/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**Application No. *JK*

10/075,330

Applicant(s)

HORNG ET AL.

Examiner

Erin M. File

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on 22 August 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-5 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1 and 3-5 is/are rejected.
- 7) ☒ Claim(s) 2 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 February 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)             | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

***Response to Arguments***

1. Applicant's arguments filed August 22, 2005 have been fully considered but they are not persuasive. The applicant traverses the rejection of Claims 1-5. The following addresses the applicants concerns.

In contrast, the claimed stores "a training signal received via the channel in a circular buffer as a circulating training signal." Note, the singular form "a training signal." It would be understood by those of ordinary skill in the art that what is claimed is a single training signal is received. Chow repeatedly sends his training signal.

The examiner suggests that Chow specifically states in the abstract "repeatedly sending a training sequence through the channel". The examiner contends that there is no significant difference between repeatedly sending a locally stored training signal and storing a training signal received via the channel in a circular buffer as a circulating training signal.

As an advantage, the invention improves the overall performance of adaptive equalizers at a reduced complexity and slow convergence rates, particularly when a short sequence of symbols is used in the training signal because the training signal is circulated. Thus, the invention can be used with equalizers with slow convergent rates, and can also be effectively used with other types of equalizers with short training signal symbol sequences, see page 3, line 14 et seq. Kim does not store a training in a circular buffer. Kim does not minimize a mean square error of the training signal. Kim does not compare the mean square error with a threshold. Kim does not equalize an input signal if the mean square error is less than the threshold. Thus, Kim in combination cannot make the invention obvious. Applicant admits that how to compute a mean square error (MSE) is known generally. However, the use of the MSE in Kim bears no relation to what is claimed or what is described by Kim. Therefore, combining Kim and Chow makes no sense. Kim applies the MSE to an already equalized (filtered)

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television signal. What is claimed is minimizing a MSE of a training signal, while estimating the training signal.

Kim does disclose evaluation a mean square error with a predetermined threshold (col. 4, lines 22-23), and if the error is greater than a predetermined error the equalizer develops new coefficients (line 29). The purpose of the Kim reference here is to demonstrate that the use of mean squared error to determine whether a signal is met a threshold, and correcting the signal through equalization if the error is too great. The Kim reference is meant to demonstrate that the use of a mean squared error compared to a threshold to determine whether the error is at an acceptable rate. The examiner contends that Kim does this effectively.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 3-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chow et al. and in further view of Kim.

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**Claim 1**, Chow discloses in the abstract “repeatedly sending a training sequence through the channel” (emphasis added). There is no significant difference between repeatedly sending a locally stored training signal and storing a training signal received via the channel in a circular buffer as a circulating training signal.

This training process is repeated until a predetermined convergence condition is detected (col. 5, line 60 – col. 6 lines 2). Chow further discloses the equalizer update method includes the use of a circular buffer for updating equalizer taps (col. 8, lines 51-66). Chow further discloses that generally this loop is repeated either until the error falls below a predetermined threshold (col. 7, lines 51-55). Chow fails to use mean square error estimation in his invention. However, Chow does use the less computationally efficient method of least mean square (LMS) error estimation. Kim discloses an equalization apparatus in which a mean squared error estimation is used (col. 4, lines 20-24). Because a mean squared error estimation is more computationally efficient than least mean squares estimation it would have been obvious to one skilled in the art at the time of invention to incorporate Kim’s mean squared error estimation method into Chow’s invention.

**Claim 3**, inherits the limitations of Claim 1. Chow further discloses a loop that is repeated either until the error falls below a predetermined threshold (col. 7, lines 51-53). Chow fails to disclose that the threshold is a target mean square error, as Chow uses a

least mean squares error estimate, however, Kim uses a least mean squares error estimation technique, the motivation for this substitution is included in Claim 1 above.

**Claim 4**, contains the limitations of Claim 1. Further, Chow fails to disclose a switch controlled by the circulation trigger which switches from feeding the training signal to the equalization and decision device during training stages and feeding the input signal to the equalization and decision device during an equalization stage. However, Kim discloses an equalizer adaptation method in which two memories are used, a first memory, (fig. 1, 21) and a second memory (25), in combination with a multiplexer (23), and a mode selection circuit (26). Kim's apparatus stores in the first memory predicted filtered data samples for the equalizer in the form of a lookup table (col. 3, lines 32-47). In the second memory values from the actual received data error is stored (col. 3 line 63 – col. 4, line 4). The mode selection circuit (26) chooses between the memory values which will be used for the equalizer coefficients and inputs that the decision to the multiplexer (23) based upon whether mean squared error is below a threshold value (col. 4, lines 30-37). This method of using training signals until a steady state is realized would be obvious to incorporate into Chow's invention because Chow discusses using the circular training signals until a threshold of convergence is reached. Therefore it would be obvious to one skilled in the art at the time of invention to incorporate Kim's selection method into Chow's apparatus.

**Claim 5**, inherits the limitations of claim 4. As discussed in Claims 1 and 3, Chow discloses means for determining if the mean square error is greater than a predetermined threshold, and minimizing the mean square error of the circulating training signal and the estimate of the training signal until the mean square error is less than the predetermined threshold. Further, Kim's discloses using the input signal and not the training signal to equalize the signal if the mean squared error is below a specific threshold as discussed in Claim 4.

#### ***Allowable Subject Matter***

4. Claim 2 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

#### ***Conclusion***

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

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shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.


6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Erin M. File whose telephone number is (571)272-6040. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Chin can be reached on (571)272-3056. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Erin M. File



10/06/2005



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